

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Eumops floridanus*

COMMON NAME: Florida bonneted bat

LEAD REGION: 4

INFORMATION CURRENT AS OF: March 2010

STATUS/ACTION

☐ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: February 17, 2010

☐ 90-day positive - FR date:

☐ 12-month warranted but precluded - FR date: October 2010

☐ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (<http://endangered.fws.gov/>) provides information on listing actions taken during the last 12 months.

☐ Listing priority change

Former LP: ☐

New LP: ☐

Date when the species first became a Candidate (as currently defined): November 9, 2009

☐ Candidate removal: Former LPN: ☐

☐ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

- ___ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
- ___ F – Range is no longer a U.S. territory.
- ___ I – Insufficient information exists on biological vulnerability and threats to support listing.
- ___ M – Taxon mistakenly included in past notice of review.
- ___ N – Taxon does not meet the Act’s definition of “species.”
- ___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Mammals, Molossidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Florida, U.S.A.

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Florida; Charlotte, Collier, Lee, Miami-Dade, Okeechobee, and Polk Counties; U.S.A.

LAND OWNERSHIP: The Florida bonneted bat has been documented at 12 locations (Marks and Marks 2008a, p. 13-14; Marks and Marks 2008b, p. 4); five locations are in private ownership: (1) Coral Gables (Granada Golf Course), (2) Homestead, (3) Naples, (4) Everglades City, and (5) North Fort Myers (S. Trokey, Service, pers. comm. 2008a; R. Arwood, Inside-Out Photography, pers. comm. 2008a; Marks and Marks 2008a, p. 13-14). Seven locations are on public lands: (1) Babcock Ranch, which is approximately 73,239 acres and managed by the Florida Fish and Wildlife Conservation Commission (FWC) and Florida Division of Forestry; (2) Fred C. Babcock / Cecil M. Webb Wildlife Management Area (Babcock / Webb), which is approximately 75,260 acres and managed by FWC; (3) Kicco wildlife management (WMA) and (4) the Kissimmee River Public Use Area (PUA) (J. Morse, FWC, pers. comm. 2010), both Kicco and the Kissimmee River PUA are located along the Kissimmee River and are managed by FWC in cooperation with the South Florida Water Management District; (5) Fakahatchee Strand Preserve State Park (Fakahatchee Preserve), which is 75,000 acres and managed by the Florida Department of Environmental Protection (FDEP) (FDEP 2006, p. 1); (6) Big Cypress National Preserve, which is comprised of 716,157 acres and managed by the National Park Service (NPS) (Marks and Marks 2008a, p. 11-14; 2008b, p. 4; 2008c, p. 11, 17); and (7) Picayune Strand State Forest (Smith 2010, p. 1), which is approximately 69,975 acres and managed by the Florida Division of Forestry. Although the public sites encompass large expanses of natural habitats, the Florida bonneted bat has only been found in discrete areas within these lands.

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BIOLOGICAL INFORMATION

Species Description: The Florida bonneted bat is a large, free-tailed bat approximately 130-165 millimeters (mm) (5.1-6.5 inches [in]) in length (Timm and Genoways 2004, p. 857), and the largest bat in Florida (NatureServe 2009, p. 4). The length of the tail ranges from 46-57 mm (1.8-2.2 in), hind foot 11-15 mm (0.4-0.6 in), ear 20-31 mm (0.8-1.2 in), and forearm 58-69 mm (2.3-2.7 in) (Timm and Genoways 2004, p. 857; NatureServe 2009, p. 4). Masses average 39.7 grams (g) (1.4 ounces [oz]) with a range from 30.2 g (1.1 oz) to at least 55.4 g (2.0 oz) in pregnant females (Belwood 1981, p. 412; Belwood 1992, p. 216; Timm and Genoways 2004, p. 857; NatureServe 2009, p. 4). Males and females are not significantly different in size (Timm and Genoways 2004, p. 857). Fur is short and glossy with hairs sharply bicolored with a white base (Timm and Genoways 2004, p. 857; NatureServe 2009, p. 4). Color varies from black to brown to brownish-gray or cinnamon brown with ventral pelage paler than dorsal (Timm and Genoways 2004, p. 857; NatureServe 2009, p. 4). Like other molossids, color is highly variable (Timm and Genoways 2004, p. 857). The distal half of the tail projects beyond the interfemoral membrane (NatureServe 2009, p. 4). The basisphenoid pits are ovoid and moderately deep (Timm and Genoways 2004, p. 857). Leathery, rounded ears are joined at the midline and project forward (NatureServe 2009, p. 4). Timm and Genoways (2004, p. 857) found no pattern of size-related geographic variation in this species.

Taxonomy: Allen (1932, p. 256-259) first described a new genus and species of Pleistocene free-tailed bat, *Molossides floridanus*, from a jaw of a single specimen. Ray *et al.* (1963, p. 373, 377-381) transferred *Molossides floridanus* to the genus *Eumops*. The genus *Eumops* was later revised (Koopman 1971, p. 1-6; Eger 1977, p. 1-69; Timm and Genoways 2004, p. 859). Koopman (1971, p. 1-6) found specimens of *Eumops* from Florida that have been identified as *E. glaucinus* to be markedly larger than tropical American material of that species and regarded *floridanus* as a well marked subspecies of *E. glaucinus*. Until recently, two subspecies of *E. glaucinus* had been recognized: *E. glaucinus floridanus*, which occurs in Florida, and *E. glaucinus glaucinus*, which occurs from central Mexico to southeastern Brazil and northwestern Argentina and Cuba and Jamaica in the Greater Antilles (Eger 1977, p. 39-43).

Timm and Genoways (2004, p. 852) reviewed and reassessed the taxonomic status of bats of the genus *Eumops*. They found considerable geographic variation among specimens of the bonneted bat (*E. glaucinus*) and determined that *E. glaucinus* is in fact a species-group consisting of greater than one species. Timm and Genoways (2004, p. 852, 855, 859) determined bonneted bats in Florida are significantly larger than those in all other populations, and have proportionally shorter and deeper basisphenoid pits; the glenoid fossa is broadly triangular with rounded apices, and bacular shape differs from populations in South America. Given these differences, Timm and Genoways (2004, p. 852, 856) indicated that the correct name for both Pleistocene and Recent Florida bonneted bats is *Eumops floridanus*. Recent studies show that morphologically *E. floridanus* is distinct from all other populations in the *E. glaucinus* complex (R. Timm, University of Kansas, pers. comm. 2008a; McDonough *et al.* 2008, p. 1306, 1311). Based upon their most recent work, McDonough *et al.* (2008, p. 1306) concluded that there are four species in the *E. glaucinus* complex—*E. glaucinus* (in South America east of the Andes), *E. ferox* (in the Caribbean, Mexico, and Central America), an unnamed taxon in western Ecuador, and *E. floridanus* in south Florida.

E. floridanus is extremely similar in both the mitochondrial and nuclear genes to the populations on Cuba and Jamaica and is clearly derived from those populations (R. Timm, pers. comm. 2008a; McDonough *et al.* 2008, p. 1309-1313). Specimens of *E. floridanus* are morphologically distinct from *E. glaucinus*, but cannot be distinguished by cytochrome-b or AFLP DNA data (McDonough *et al.* 2008, p. 1312-1313). McDonough *et al.* (2008, p. 1313) stated: "Examination of mtDNA, nuclear AFLP, karyotypic, and morphological data within the *E. glaucinus* complex suggests that morphological distinction in *E. floridanus* has preceded establishment of either mitochondrial or nuclear distinction. The significance of this observation is that it documents fluctuating tempos of evolution across multiple character sets (mtDNA, nuclear, and morphological) that typically are used to define species." McDonough *et al.* (2008, p. 1313) stated that while adherence to the genetic species concept would relegate *E. floridanus* to conspecific status with *E. glaucinus*, morphological and ecological concepts clearly call for the recognition of *E. floridanus* as a distinct species.

The Florida bonneted bat (*E. floridanus*) was previously known as Florida mastiff bat, Wagner's mastiff bat, and mastiff bat (*E. glaucinus floridanus*) (Belwood 1992, p. 216). While earlier literature found the Florida bonneted bat distinct at the subspecies level (see Timm and Genoways 2004, p. 852, 856; McDonough *et al.* 2008, p. 1307), the most current scientific information confirms that *E. floridanus* is a full species and this taxonomic change has been accepted by the scientific community (Timm and Genoways 2004, p. 861; McDonough *et al.* 2008, p. 1306-1315; R. Timm, pers. comm. 2008b, 2009). NatureServe (2009, p. 1) and the Florida Natural Areas Inventory (FNAI 2010, p. 24) use the name *E. floridanus*. The FWC biological staff uses the name *E. floridanus* and cites that taxon in its species ranking database (J. Gore, FWC, pers. comm. 2009). We have carefully reviewed the available taxonomic information regarding the Florida bonneted bat, and there is no question that it is a valid taxon and entity that could be listed pursuant to the Endangered Species Act.

Habitat/Life History: Relatively little is known of the ecology of the Florida bonneted bat and long-term habitat requirements are poorly understood (Robson 1989, p. 2; Robson *et al.* 1989, p. 81; Belwood 1992, p. 219; Timm and Genoways 2004, p. 859). Recent information on foraging habitat has been obtained largely through acoustical surveys, designed to detect and record bat echolocation calls (Marks and Marks 2008a, p. 5).

In general, open, fresh water and wetlands provide prime foraging areas for bats (Marks and Marks 2008c, p. 4). Bats will forage over ponds, streams, and wetlands and drink when flying over open water (Marks and Marks 2008c, p. 4). During dry seasons, bats become more dependent on remaining ponds, streams, and wetland areas for foraging purposes (Marks and Marks 2008c, p. 4). The presence of roosting habitat is critical for day roosts, protection from predators, and the rearing of young (Marks and Marks 2008c, p. 4). For most bats, the availability of suitable roosts is an important, limiting factor (Humphrey 1975, p. 341-343). South Florida bats roost primarily in trees and manmade structures (Marks and Marks 2008a, p. 8).

Belwood (1981, p. 412) found a small colony (seven females, one male) of Florida bonneted bats

roosting in a longleaf pine (*Pinus palustris*) in a pine flatwoods community near Punta Gorda in 1979. The bats were roosting in a cavity 4.6 meters (m) (15.1 feet [ft]) high, which had been excavated by a red-cockaded woodpecker (*Picoides borealis*) and later enlarged by a pileated woodpecker (*Dryocopus pileatus*) (Belwood 1981, p. 412). Belwood (1981, p. 412) suggested that the bats were permanent residents of the tree due to the considerable accumulation of fecal material, approximately 1 m (3.3 ft) in depth. Specimens from Coral Gables have been found in the shafts of royal palm (*Roystonea regia*) leaves (Belwood 1992, p. 219). Hipes *et al.* (2001, p. N/A) also indicated that it roosts in palms.

In 2006, the species was found at Babcock / Webb in the general vicinity of the colony found by Belwood (1981, p. 412); this was the first documentation of the Florida bonneted bat at this location since 1979 (Marks and Marks 2008a, p. 6, 11, 13). Major habitat types at Babcock / Webb include dry prairie, freshwater marsh, wet prairie, and pine flatwoods (Marks and Marks 2008a, p. A7). Similarly, this species was recorded at Telegraph Swamp at Babcock Ranch in 2007 (Marks and Marks 2008a, p. A9).

In 2000, the bat was found at Dismal Key within the Ten Thousand Islands (Timm and Genoways 2004, p. 861; Marks and Marks 2008a, p. 6). Subsequent surveys in 2000, 2006, and 2007 did not document any calls at this location (Marks and Marks 2008a, p. 6, 11, 14). The recent surveys included the area surrounding Dismal Key and encompassed the Fakahatchee-Union waterway and canal (Marks and Marks 2008a, p. 4).

For the past several years, the Florida bonneted bat has been found within the Fakahatchee Preserve and uses this area throughout the year (D. Giardina, FDEP, pers. comm. 2006; C. Marks, Florida Bat Conservancy (FBC), pers. comm. 2006a, 2006b). In 2006, this species was found at a small lake and at a canal adjacent to tropical hardwood hammocks in the Fakahatchee Preserve (Marks and Marks 2008a, p. 11, A7-A9). At Big Cypress, surveys were conducted in a variety of habitats, the majority consisting of cypress swamps and wetlands, but only one call was recorded in 16 survey nights (Marks and Marks 2008a, p. 11, A12-A14).

In 2008, the Florida bonneted bat was found at two locations along the Kissimmee River during a survey of public areas contracted by FWC (J. Morse, FWC, pers. comm. 2008, 2010; Marks and Marks 2008b, p. 2-5; Marks and Marks 2008c, p. 1-28). One location is at an oxbow along the Kissimmee River in a pasture in Kicco (Marks and Marks 2008c, p. 11). The other location is at Platt's Bluff boat ramp at a public park on the Kissimmee River (Marks and Marks 2008c, p. 17).

In 2009, FWC biologists and volunteers caught a free-flying juvenile male Florida bonneted bat in Picayune Strand State Forest (PSSF) above the Faka-Union Canal in Collier County, Florida (Smith 2010, p. 1).

This species has been known to roost in buildings, tree cavities, outcrops, and bat houses (Marks and Marks 2008a, p. 8). The Florida bonneted bat uses human structures and other non-natural environments. Past sightings indicate diurnal roosts may include the shingles under Spanish-style barrel tiles of roofs in Coral Gables and Miami (Belwood 1992, p. 219), often in buildings

dating from about 1920-1930 (NatureServe 2009, p. 4).

This species can also roost in attics, rock or brick chimneys, and fireplaces of old buildings (NatureServe 2009, p. 4). A colony was found in a limestone outcropping on the north edge of the University of Miami campus in Coral Gables; the limestone contained a large number of flat, horizontal eroded fissures in which the bats roosted (Timm and Genoways 2004, p. 860). Belwood (1992, p. 220) suggested that urban bats using Spanish tile roofs on dwellings would appear to benefit, since the human population in south Florida is growing, and such structures are as common now as in the past. However, it is important to recognize that bats using old / abandoned and new dwellings are at significant risk; bats are removed when structures are demolished or when they are no longer tolerated by humans (see Factor E).

Acoustical surveys in 2006 and 2008 confirmed that the bat was using a golf course where it was previously found in suburban Coral Gables (Marks and Marks 2008a, p. 6, 11, A4; 2008b, p. 1-6). In addition, the species has been found to regularly use bat house(s) on private land in Lee County; until recently this was the only known location of an active colony roost (S. Trokey, pers. comm. 2006a, 2008b; Marks and Marks 2008a, p. 7, 15). In winter 2008, two new colonies were found using bat houses at Babcock / Webb (N. Douglass, FWC, pers. comm. 2009). Since that time, the FWC has monitored approximately 25 individuals at two additional bat houses, bringing the potential total at Babcock / Webb to 58 individuals, which occupy four boxes (J. Birchfield, FWC, pers. comm. 2010).

Overall, little is known about the current natural roost sites in Florida. This species may roost in rocky crevices and outcrops on the ground based on the discovery of an adult for which the specimen tag says “found under rocks when bull-dozing ground” (Timm and Genoways 2004, p. 860). It is not known to what extent such roost sites are suitable. Robson (1989, p. 2) indicated that Florida bonneted bats are closely associated with forested areas because of their tree-roosting habits. Existing roost sites need to be identified so they can be preserved and protected (Marks and Marks 2008a, p. 15).

The Florida bonneted bat roosts singly or in groups of up to a few dozen individuals (NatureServe 2009, p. 4). G. T. Hubbell believed that the bats that occurred in Miami roosted singly (Belwood 1992, p. 221). Belwood (1981, p. 412) suggested that the colony of bats (seven females and one male) in Punta Gorda used a longleaf pine cavity as a permanent roost site and that the colony was a harem group, based on its sex ratio. Belwood (1981, p. 412; 1992, p. 221) suggested that this behavior has been recorded in a few bat species and such social groupings may be facilitated by roosting in tree cavities, which can be defended from other males (Morrison 1979, p. 11-15). Based on recorded calls, one colony is located in Homestead, but its location and the number of bats in the colony is currently unknown (Marks and Marks 2008b, p. 4).

The colony on private property in Lee County, consisted of 20 to 24 individuals, including one albino, was using two bat houses (S. Trokey, pers. comm. 2006a, 2006b; 2008a, 2008b). However, after the prolonged cold temperatures in early 2010, a total of nine individuals remain, with seven occupying one house and two occupying another (S. Trokey, pers. comm. 2010a, 2010b). The sex ratio is not known. The bats move between the two houses and the albino has

been observed to be in one house one day and the other house the next (S. Trokey, pers. comm. 2006a). At Babcock / Webb, two colonies comprised of 33 individuals are using two bat houses (Morse 2008, p. 8, N. Douglass, pers. comm. 2009). Another 25 individuals are using two additional bat houses (J. Birchfield, pers. comm. 2010). Little additional data on roost size are available because so few colonies are known.

The Florida bonneted bat is not migratory (Timm and Genoways 2004, p. 860; NatureServe 2009, p. 4). Timm and Genoways (2004, p. 860) stated, "There is no evidence nor reason to suspect that *E. floridanus* is migratory. However, there might have been seasonal shifts in roosting sites because Belwood (1992:217) reported that bonneted bats were found "during the winter months in people's houses."

Precise foraging habits and requirements are not known (Belwood 1992, p. 219). Florida bonneted bats feed on flying insects (e.g., Coleoptera, Diptera, Hemiptera) (Belwood 1981, p. 412; Belwood 1992, p. 220). An analysis of bat guano from the colony using the pine flatwoods in Punta Gorda indicated that the sample contained coleopterans (55 percent by volume), dipterans (15 percent), and hemipterans (10 percent) (Belwood 1981, p. 412; Belwood 1992, p. 220). Bats within this genus are strong, fast fliers that can undertake foraging flights exceeding 6 hours (NatureServe 2009, p. 5). Bonneted bats are "fast hawking" bats that rely on speed and agility to catch insects in the absence of clutter (Simmons *et al.* 1979, p. 16-21). The Florida bonneted bat forages in open spaces and uses echolocation to detect prey at relatively long range, roughly 3-5 m (10-16 ft) (Belwood 1992, p. 221). Based upon information from G. T. Hubbell, Belwood (1992, p. 221) indicates that these bats leave their roosts to forage after dark, seldom occur below 10 m (33 ft) in the air, and produce loud, audible calls as they fly; the calls are easily recognized by humans.

The Florida bonneted bat has a fairly extensive breeding season during summer months (Timm and Genoways 2004, p. 859; NatureServe 2009, p. 4). Marks and Marks (2008a, p. 8; 2008c, p. 4) indicate that the maternity season for most bat species in Florida occurs from mid-April through mid-August. During the early portion of this period, females give birth to young and leave them in the roost while they make multiple foraging excursions to support lactation (Marks and Marks 2008a, p. 8-9). During the latter portion of the season, young and females forage together until the young become sufficiently skilled to forage and survive on their own (Marks and Marks 2008a, p. 9). The Florida bonneted bat is a more tropical species and pregnant females have been found in June through September (Marks and Marks 2008a, p. 9). Timm and Genoways' (2004, p. 859) examination of limited data suggests that this species may be polyestrous, with a second birthing season possibly in January - February.

The bat has low fecundity; litter size is one (NatureServe 2009, p. 2). The colony studied by Belwood (1981, p. 412) consisted of eight adults and included five post-lactating females, one pregnant female with a single fetus, and one male with enlarged testicles; the other female escaped before examination. The pregnant female captured was the first record of a gestating, female Florida bonneted bat in September (Belwood 1981, p. 412). However, Belwood (1981, p. 412) noted that this finding is consistent with the reproductive chronology of bonneted bats in Cuba, which are polyestrous. Robson *et al.* (1989, p. 81) found an adult female in Coral Gables

that aborted a fetus in early September 1988. The landowner with the active colony in Lee County reports that she has seen young bats appear in spring and summer, generally with only one or two births within the colony per year (S. Trokey, pers. comm. 2006a). However, she observed four young in 2004 (S. Trokey, pers. comm. 2006a). The juvenile male caught in a mist net at Picayune Strand State Forest on December 17, 2009 suggests breeding in the area (Smith 2010, p. 1). Age was determined by viewing the epiphyseal-diaphyseal fusion under a magnifying glass with photograph of the fusion and independent confirmation by two Florida bat experts (Smith 2010, p. 1-2). The juvenile weighed 35 g and had a left forearm length of 64.5 mm (Smith 2010, p. 1).

There is only one record of natural predation upon this species (Timm and Genoways 2004, p. 860). A skull of one specimen was found in a regurgitated owl pellet in June 2000 at the Fakahatchee Preserve (Timm and Genoways 2004, p. 860-861; C. Marks, pers. comm. 2006a; Marks and Marks 2008a, p. 6).

Historical Range/Distribution: Remains from this species are documented from the late Pleistocene (approximately 11,700 years ago) in Melbourne, Brevard County, and at Monkey Jungle Hammock in Miami-Dade County. Remains dating from the Holocene (time period beginning 10,000 years ago) are known from Vero Beach, Indian River County, which was considerably further north than living individuals have been found (Allen 1932, p. 256; Ray 1958, Martin 1977, and Morgan 1985, 1991, 2002 as cited in Timm and Genoways 2004, p. 857) until recently (Marks and Marks 2008b, p.5).

Most of the historical records and sightings for this species are several decades old from the cities of Coral Gables and Miami in extreme southeastern Florida (Belwood 1992, p. 219; Timm and Genoways 2004, p. 857; NatureServe 2009, p. 3) where it was once believed to be common (Belwood 1992, p. 216). G. T. Hubbell reported a female with young from Fort Lauderdale in Broward County; all of his sightings were near human dwellings (Belwood 1992, p. 219). Prior to 1967, G. T. Hubbell routinely obtained several individuals per year that were collected during the winter months in houses and regularly heard loud, distinctive calls at night as the bats foraged above buildings (Belwood 1992, p. 216-217). Belwood (1981, p. 412) found a colony in Punta Gorda. However, the longleaf pine in which the bats roosted was felled during highway construction (Belwood 1981, p. 412).

Current Range/Distribution: The Florida bonneted bat exists only in Florida (Timm and Genoways 2004, p. 856-857; C. Marks and G. Marks, pers. comm. 2008). This species has one of the most restricted distributions of any bat species in the New World (Belwood 1992, p. 218-219; Timm and Genoways 2004, p. 852, 861-862) and its global range is estimated at < 100 – 250 square kilometers (40-100 square miles) (NatureServe 2009, p. 3). Its current range includes Charlotte, Collier, Lee, Miami-Dade, Okeechobee, and Polk Counties (Timm and Genoways 2004, p. 856-857; Marks and Marks 2008b, p. 4). Surveys conducted in the Kissimmee River area for the FWC recorded Florida bonneted bat calls at two locations (Marks and Marks 2008b, p. 2; 2008c, p. 1-28). The findings along the Kissimmee River are significant as it is the first time the species has been found north of Lake Okeechobee except in fossil records and

effectively moves the known range 80 kilometers (50 miles) north (Marks and Marks 2008b, p. 2, 5).

Other stationary and roving acoustical surveys of select, public lands in the southwest region of Florida contracted by FWC in 2007-2008 did not produce any additional occurrences (Morse 2008, p. 1-14). The bat was only found at Babcock / Webb and at two WMAs along the Kissimmee River; however, it was not found at Chassahowitzka, Hilochee, or Hickory Hammock WMAs or during surveys along the Lake Wales Ridge (Morse 2008, p. 1-14; Marks and Marks 2008b, p. 3). It was not found elsewhere in Highlands, Okeechobee, or Polk Counties (Marks and Marks 2008c, p. 1-28; 2008d, p. 1-21). In addition, surveys did not locate the bat in the Everglades region, despite the fact that this region links the eastern and western portions of the range (Marks and Marks 2008a, p. 10). More work should be conducted in the Everglades region to determine if this area should be included, or excluded, from the species' current range (Marks and Marks 2008a, p. 10). Overall, based upon all available historic and current surveys, the species exists within a very restricted range (Timm and Genoways 2004, p. 852, 861-862; Marks and Marks 2008a, p. 15).

Although older literature lists Fort Lauderdale as an area where the species occurred (Belwood 1992, p. 218), none of the recent specimens examined by Timm and Genoways (2004, p. 856-857, 864) were from Broward County. However, Hipes *et al.* (2001, p. N/A) included Broward County as part of the range. Marks and Marks (2008a, p. 13) did not record any Florida bonneted bat calls in the Fort Lauderdale area; surveys were conducted in Long Key Park, Miramar Pinelands, and the Plantation area. No calls were recorded on the east coast of Florida north of Coral Gables (Marks and Marks 2008a, p. 10).

In Miami-Dade County, Florida bonneted bats were identified in acoustical surveys at the Granada Golf Course in Coral Gables (Marks and Marks 2008a, p. 6; 2008b, p. 1-6). Coral Gables is the sole location where there has been a consistent history of presence of the species (Marks and Marks (2008a, p. 6, A4). No calls were recorded in the area surrounding Granada Golf Course in July 2006 (Marks and Marks 2008a, p. 11, A4-A5). However, calls were recorded in September 2008, indicating that the species continues to be present in the Coral Gables area (Marks and Marks 2008b, p. 1-6). In September 2008, a call was recorded at Snapper Creek Park in south Miami, 6.5 miles southwest of the Coral Gables location; this is the first recording of a Florida bonneted bat call in Miami outside of the Coral Gables area (Marks and Marks 2008b, p. 1-2). A dead Florida bonneted bat was found on the ground at the Miami Metro Zoo in 2005, but no calls were recorded there in 2006 (Marks and Marks 2008a, p. 6, 13). Miami-Dade County biologists observed seven bats similar in size to Florida bonneted bats and heard chatter at the correct frequency a few years ago at the Metro Zoo, but were unable to obtain definitive recordings (S. Thompson, Miami-Dade Park and Recreation Department, pers. comm. 2010a). County biologists are planning to work with researchers and zoo staff to determine potential presence at this location in 2010 (S. Thompson, pers. comm. 2010b). In August 2006, one call was recorded along Canal Street in the Homestead area (Marks and Marks 2008a, p. 11, A6-A7). Calls recorded in September 2008, provide additional evidence the species is present in the Homestead area (Marks and Marks 2008b, p. 5).

In Collier County, the species was identified along Jane's Scenic Highway in the Fakahatchee Preserve (D. Giardina, pers. comm. 2006; C. Marks, pers. comm. 2006a, 2006b; Timm and Genoways 2004, p. 860-861; Marks and Marks 2008a, p. 6). In 2006, calls were recorded at Ballard Pond and Prairie Canal Bridge in Fakahatchee Preserve (Marks and Marks 2008a, p. 11, A8-A9). In total, 57 calls were recorded over 11 survey nights in the Fakahatchee Preserve (Marks and Marks 2008a, p. 11). One call was recorded in 12 survey nights at Deep Lake on the western edge of Big Cypress (off of State Road 29) near the eastern edge of the Fakahatchee Preserve; habitat is comprised of cypress and hammock and similar to that at Ballard Pond (R. Arwood, pers. comm. 2008b; Marks and Marks 2008a, p. 11). In December 2009, the FWC and volunteers captured a juvenile Florida bonneted bat in a mist net above a canal in Picayune Strand State Forest (Smith 2010, p. 1). Additional trapping efforts (14 trap nights) yielded no additional Florida bonneted bats, but resulted in the capture of several other species (K. Smith, FWC, pers. comm. 2010). In Everglades City, 33 calls were recorded in 328 survey nights during a continuous, stationary, acoustical study (i.e., 24 hours a day) (R. Arwood, pers. comm. 2008a; Marks and Marks 2008a, p. 11). In Naples using similar techniques, only five calls were recorded in 398 survey nights (R. Arwood, pers. comm. 2008a, Marks and Marks 2008a, p. 11). Arwood (pers. comm. 2008a) noted that on an average night he recorded more than 1,000 bat calls (i.e., all species); however, only five Florida bonneted bat calls in total were recorded out of hundreds of thousands of calls. In 2000, the Florida bonneted bat was also found at Dismal Key in Ten Thousand Islands National Wildlife Refuge (NWR) (Timm and Genoways 2004, p. 861; B. Nottingham, Service, pers. comm. 2006; T. Doyle, Service, pers. comm. 2006; C. Marks, pers. comm. 2006c; Marks and Marks 2008a, p. 6). However, calls were not recorded within Ten Thousand Islands NWR during the 2006-2007 survey (Marks and Marks 2008a, p. 11, 14, A9).

In Lee County, the Florida bonneted bat has continually used bat houses on one private property since December 2002 (S. Trokey, pers. comm. 2006a; Marks and Marks 2008a, p. 7). This was the first record of this species using a bat house as a roost (S. Trokey, pers. comm. 2006a; Marks and Marks 2008a, p. 7). No other occurrences in Lee County are known (Marks and Marks 2008a, p. 11).

In Charlotte County, the bat was found during acoustical surveys at Babcock / Webb and Babcock Ranch in 2006-2007 (C. Marks, pers. comm. 2006d; Marks and Marks 2008a, p. 11, 13). Calls (3) were recorded near a lake and within pine flatwoods (Marks and Marks 2008a, p. A7). Similarly, calls (11) were recorded at Telegraph Swamp at Babcock Ranch in 2007 (Marks and Marks 2008a, p. A9). In 2008, two colonies were found using bat houses placed at Babcock / Webb (N. Douglass, pers. comm. 2009). Since that time, the FWC has monitored approximately 25 individuals at two additional bat houses, bringing the potential total at Babcock / Webb to 58 individuals, which occupy four boxes (J. Birchfield, FWC, pers. comm. 2010)

Calls were recorded at Kicco and Platt's Bluff along the Kissimmee River in Polk and Okeechobee Counties in May 2008 (Marks and Marks 2008b, p. 2; 2008c, p. 11, 17). The Platt's Bluff finding is 85 kilometers (53 miles) northeast of the nearest previously recorded location, which was in Telegraph Swamp within the Babcock Ranch (Marks and Marks 2008b, p. 3).

Population Estimates/Status: This species was considered common in the Miami / Coral Gables area because of regular collection of specimens from 1951-1965 (Robson 1989, p. 2; Belwood 1992, p. 216). Timm and Genoways (2004, p. 861) found only three records in the greater Miami area after 1965. The colony found near Punta Gorda in 1979 appeared to be the only recorded occurrence since 1967 (Belwood 1981, p. 412). A 6-week field trip in 1980 to locate other occurrences was unsuccessful and led to the belief that this species was probably extinct (Belwood 1992, p. 217). No new evidence of this species was found from 1979 until 1988 when Robson *et al.* (1989, p. 81) found a pregnant female in Coral Gables (Robson 1989, p. 2).

It is probable that the Florida bonneted bat has been uncommon for several decades based upon the work of previous researchers (Barbour 1945, Jennings 1958, and Layne 1974 as cited in Timm and Genoways 2004, p. 861), who noted the species' scarcity. Owre (1978, p. 43) observed less than a dozen individuals in roughly 25 years and noted that few mammalogists had success in finding the species. Robson (1989, p. 5) indicated that the decline of specimens and sightings in the mid-1960s is reflected in the museum record and noted that the 1950s and 1960s was a period of rapid growth in the Miami area. Robson (1989, p. 5-9) suggested that the resulting disturbance and destruction of native habitat may have flushed a large number of specimens out of established roosts, resulting in a high collection rate. One museum specimen was originally discovered under a rock that was turned over by a bulldozer clearing land (Robson 1989, p. 9). A highway construction project in 1979 destroyed a roost tree (Belwood 1981, p. 412; 1992, p. 220). A status survey conducted in 1989, encompassing 25 sites within natural areas within a nine-county area, found no new evidence of this species (Robson 1989, p. 1, 3-5, 8).

The Service funded a range-wide study to determine the status of the Florida bonneted bat following the 2004 hurricane season. Current known sites and previously un-surveyed areas were surveyed within the species' historic range to determine presence and abundance (Marks and Marks 2008a, p. 3); the study was not designed to search for roosting sites or map foraging areas. Acoustical methods were selected over mist netting as the primary survey methodology because this species is known to fly and forage at heights of thirty or more feet (Marks and Marks 2008a, p. 3). The FWC also funded stationary and roving acoustical surveys of select public lands in the southwest region of Florida in 2007-2008 (Morse 2008, p. 1-14). The Florida bonneted bat has a unique and easily identifiable call. While most North American bats vocalize echolocation calls in the ultrasonic range that are inaudible to humans, the Florida bonneted bat echolocates at the higher end of the audible range, which can be heard by some humans as high pitched calls (Marks and Marks 2008a, p. 5). Surveys were conducted using acoustical equipment that can detect echolocation calls within a range of 100 feet; call sequences were analyzed using software that compares calls to a library of signature calls (Marks and Marks 2008a, p. 5). Florida bonneted bat calls are relatively easy to identify because calls are issued at frequencies well below that of other Florida bat species (Marks and Marks 2008a, p. 5).

Results of the range-wide survey indicate that the Florida bonneted bat is a rare species with limited range and low abundance (Marks and Marks 2008a, p. 15). Based upon results of both the range-wide study and survey of select public lands, the species has been found at 12 locations (Marks and Marks 2008b, p. 4), but the number and status of the bat at each location is unknown.

The capture of a juvenile male by FWC at Picayune Strand State Forest in 2009 (Smith 2010, p. 1) confirms the species at a new location. However, it is possible that this individual is part of the colony using the Fakahatchee Preserve (C. Marks, pers. comm. 2010). Marks and Marks (2008a, p. 15) stated, “it is possible that the entire population of Florida bonneted bats may number less than a few hundred individuals.” Marks and Marks (2008a, p. 15) based this upon the small number of locations where calls were recorded, the low numbers of calls recorded at each location, and the fact that the species forms small colonies. At this time, it is not known if the species persists at sites previously documented (or at previously estimated numbers) following the prolonged cold temperatures from January and February 2010 (see Factor E.). However, plans are underway to confirm presence at all sites this year.

Results of the 2006-2008 acoustical range-wide survey indicate that of 5,016 calls recorded and analyzed, only 79 (1.6 percent) were from Florida bonneted bats (Marks and Marks 2008b, acoustical data). Of these, 42 were from Coral Gables, 13 from the Fakahatchee Preserve, 11 from Babcock Ranch, 6 near the bat houses in Lee County, 3 from Babcock / Webb, 3 from the Homestead area, and 1 from Snapper Creek Park (Marks and Marks 2008a, p. 11). Of 673 calls recorded and analyzed along the WMAs of the Kissimmee River, only 10 (1.4 percent) were from the Florida bonneted bat (Marks and Marks 2008c, p. 7-17). The bat houses in Lee County are the only known location of an active Florida bonneted bat colony roost on private land (Marks and Marks 2008a, p. 15). The colony once included approximately 20 to 24 individuals in two houses (S. Trokey, pers. comm. 2008a, 2008b), but only nine remain after the prolonged cold temperatures in early 2010 (S. Trokey, pers. comm. 2010a, 2010b). The two colonies at Babcock / Webb are the only known roosts on public lands and effectively tripled the number of known active colonies for this species (N. Douglass, pers. comm. 2009). The 33 individuals at Babcock / Webb appear to be the largest single discovery of the species recorded in recent years (N. Douglass, pers. comm. 2009). Since that time, the FWC has monitored approximately 25 individuals at two additional bat houses, bringing the potential total at Babcock / Webb to 58 individuals, which occupy four boxes (J. Birchfield, pers. comm. 2010).

Overall, the range-wide study targeted current known sites and previously un-surveyed areas within the species’ historic range, encompassing large portions of a nine-county area roughly from Lake Okeechobee and south (Marks and Marks 2008a, p. 10). More survey work was recommended for the Coral Gables area due to the few calls and the possibility that only one colony remains; more work was also recommended for Everglades National Park because it links the east and west portions of the known range, but to date there is no evidence of presence in this area (Marks and Marks 2008a, p. 15). The FWC-funded survey of select public lands included areas within and outside the known range. Discovery of Florida bonneted bats along the Kissimmee River was a major finding because the nearest previously known location was 50 miles to the southwest at Babcock / Webb (Marks and Marks 2008b, p. 5; 2008c, p. 3). As a result of this study, more work was recommended for the Kissimmee River area and areas north of the Kicco WMA to determine the northern extent of the species’ range (Marks and Marks 2008b, 5). Although it is possible that additional locations will be found with more survey work, it is unlikely that large numbers of individuals will be found.

The Florida bonneted bat is recognized in Florida’s Comprehensive Wildlife Conservation Strategy as one of Florida’s species of greatest conservation need (FWC 2005, p. 61). This

species is listed as endangered by the FWC as the Florida mastiff bat (*Eumops glaucinus floridanus*). At this time, there is no State-approved management plan for this species. The Florida Natural Areas Inventory (FNAI 2010, p. 24) considers the global status of the Florida bonneted bat to be G1, critically imperiled. NatureServe (2009, p. 1) considers it to have a rounded global status of G1, critically imperiled, because it has a restricted range and natural habitat has been lost. The 2010 International Union for Conservation of Nature (IUCN) Red List of Threatened Species lists *Eumops floridanus* as critically endangered because “its population size is estimated to number fewer than 250 mature individuals, with no subpopulation greater than 50 individuals, and it is experiencing a continuing decline” (Timm and Arroyo-Cabrales 2008, p. 2).

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

Habitat loss and alteration in forested and urban areas are substantial threats to the Florida bonneted bat (Belwood 1992, p. 220; NatureServe 2009, p. 2). In natural areas, this species may be impacted when forests are converted to other uses or when old trees with cavities are removed (Belwood 1992, p. 220; NatureServe 2009, p. 2). In urban settings, this species may be impacted when buildings with suitable roosts are demolished (Robson 1989, p. 15; NatureServe 2009, p. 2) or when structures are modified to exclude bats.

Robson (1989, p. 1-18) attributed the loss of native forested habitat, reduced insect abundance (see Factor E), and the active persecution of bats by humans (see Factor E) as the likely major impacts on the species in Miami-Dade County. Similarly, Belwood (1992, p. 217, 220) indicated that bats in south Florida, including this species, appear to have declined drastically in numbers in recent years due to loss of roosting sites and effects of pesticides (see Factor E). More recently, Timm and Genoways (2004, p. 861) stated that habitat loss from development, in combination with other threats (i.e., pesticides and hurricanes, see factor E), may have had a significant impact upon the already low numbers of Florida bonneted bats.

Belwood (1992, p. 220) stated that forested areas are becoming rare as a result of human encroachment and that this would severely affect the forest occurrences of this species. Similarly, Robson (1989, p. 15) indicated that pine rockland, live oak, and tropical hardwood hammocks constituted most of the remaining, natural forest in the Miami area and that these communities are essential to this species' survival. Belwood (1992, p. 220) argued that tree cavities are rare in southern Florida and competition for them (e.g., flying squirrels, red-headed woodpeckers [*Melanerpes erythrocephalus*], corn snakes) is intense. She suggested that non-urban natural areas such as Everglades National Park, Big Cypress / Fakahatchee areas, and State WMAs may be the only areas where this species may be found in the future, provided old trees with hollows and cavities are retained (Belwood 1992, p. 220). If dead or live trees with cavities are to be felled during management practices, cavities need to be examined for potential colonies (Marks and Marks 2008c, p. 6). This is especially important since no locations of natural roost sites are known. Further searches for roosting sites and associated foraging areas are needed. Due to the species' vulnerability (i.e., low population

size, restricted range, low fecundity), every effort should be made to protect existing roosts and surrounding habitats (Belwood 1992, p. 219; NatureServe 2009, p. 2; Marks and Marks 2008a, p. 15; Timm and Arroyo-Cabrales 2008, p. 5).

Loss and modification of forested habitat continues today and is expected to increase. Hardwood forests in South Florida are estimated to be reduced by over 2100 percent by the year 2040 - a far greater rate and much greater extent than anywhere else in the southern United States (U.S. Forest Service 2002). Three counties of known occurrence for the bat that have natural suitable habitat remaining - Charlotte, Lee, and Collier - are expected to reach build-out (develop; modeling is based upon the amount of urban land needed to accommodate increased human population) before 2060 (Zwick and Carr 2006, p. 12, 16). In the model, for the period between 2040 and 2060, the population of Lee and Collier counties was projected to exceed the available vacant land area, so population was allowed to spillover into adjacent counties (Zwick and Carr, p. 13). According to human population distribution models, south Florida is expected to become mostly urbanized with the exception of some of the agricultural lands north and south of Lake Okeechobee (Zwick and Carr 2006, p. 2). Even the central Florida region, at what would be the northern limit of this species' distribution, will be almost entirely urbanized (Zwick and Carr 2006, p. 2). Although the seven occurrences on conservation lands are inherently more protected than those on private lands, habitat alteration during management practices may impact natural roosting sites because the locations of such sites are unknown. Removal of old or live trees with cavities during activities associated with forest management (e.g., thinning, pruning), prescribed fire, or trail maintenance may inadvertently remove roost sites, if such sites are not known. Loss of an active roost or removal during critical life history stages (e.g., when females are pregnant or rearing young) can have severe ramifications considering the species' low population size and low fecundity (see Factor E). Therefore, we conclude that occupied and potential habitat for the Florida bonneted bat on forested or wooded lands, both private and public, continues to be at risk due to habitat loss, degradation, and fragmentation.

Since the bat will use human dwellings and other artificial structures, it is also vulnerable to habitat loss and alteration in urban environments (Belwood 1992, p. 220; NatureServe 2009, p. 2). Owre (1978, p. 43) stated that all recent specimens had been collected within the suburbs of greater Miami from buildings and architecture from the 1920s and 1930s. Owre (1978, p. 43) indicated that three specimens were taken on the ground, one in a rocky field that was being bulldozed, one next to sewer conduits piled near freshly dug excavations, and one on a lawn near a university building in which the bats roosted. Removal of buildings with spaces suitable for roosting is a threat to this species (NatureServe 2009, p. 2). Robson (1989, p. 15) stated that seemingly innocuous activities like destroying abandoned buildings and sealing barrel-tile roof shingles may have a severe impact on remaining populations in urban areas. Cyndi and George Marks (pers. comm. 2008) stated that the bat can move into new buildings as well and "the fact that they adapt well to manmade structures has most likely been a large factor in their decline" (see Factor E). The use of buildings or other structures inhabited by or near humans, places bats at risk of persecution and removal (see Factor E).

In summary, nearly half of the occurrences are on private lands, and occurrences on public lands are at some risk to habitat loss and modification. Therefore, the threat of habitat destruction or modification of natural roosting and foraging habitats is considered to be of high magnitude and imminent. The loss of manmade roost sites and artificial structures can occur at any time; this threat is considered to be imminent, but moderate in magnitude because such structures can possibly be replaced.

- B. Overutilization for commercial, recreational, scientific, or educational purposes. We have no information to indicate that overutilization is a threat.
- C. Disease or predation. In general, animals such as owls, hawks, raccoons, skunks, and snakes prey upon bats (Harvey *et al.* 1999, p. 13). However, few animals consume bats as a regular part of their diet (Harvey *et al.* 1999, p. 13). There is only one record of natural predation on this species (Timm and Genoways 2004, p. 860). A skull of one specimen was found in a regurgitated owl pellet on June 17, 2000, at Fakahatchee Preserve (Timm and Genoways 2004, p. 860-861; C. Marks, pers. comm. 2006a; Marks and Marks 2008a, p. 6). We have no information suggesting that predation is causing a decline in the status of the species. Although disease is a significant threat for other bat species, it is not known to be a threat for the Florida bonneted bat at this time. In summary, we do not believe that predation or diseases are threats to this species at this time.
- D. The inadequacy of existing regulatory mechanisms. Federal, State, and local laws have not been sufficient to prevent past and ongoing impacts to the Florida bonneted bat.

The species is listed as endangered in the State of Florida as the Florida mastiff bat (Florida Administrative Code, Chapter 68). As such, it is afforded protective provisions specified in Chapter 68A-27 rules (68A-27.0011 and 68A-27.003). This designation prohibits any person from pursuing, molesting, harming, harassing, capturing, possessing, or selling this species, or parts thereof, except as authorized by specific permit, with permits being issued only when the permitted activity will clearly enhance the survival potential of the species. Although provisions prohibit take of individuals, there is no substantive protection of habitat or protection of potentially suitable habitat.

Humans often considered bats to be “nuisance” species when they occur in or around human dwellings or infrastructure (see Factor E). The rules for taking of nuisance wildlife are provided under Florida Administrative Code Chapter 68A-9.010 rules. Under these rules, property owners can take nuisance wildlife or may authorize another person to take nuisance wildlife on their behalf. These rules allow bats to be taken when: the taking is incidental to the use of an exclusion device, a device which allows escape from and blocks re-entry into a roost site located within a structure (including chemical repellants), at any time from August 15 to April 15 or when the take is incidental to permanent repairs which prohibit the egress of bats from a roost site located within a structure provided an exclusion device is used for a minimum of four consecutive days/nights for which the low temperature is forecasted to remain above 50° F prior to repairs and during the time-period specified. Use of bat exclusion devices or any other intentional device or material at a roost site which may

prevent or inhibit the free ingress and/or egress of bats are prohibited from April 16 through August 14. The FWC, FBC, and Bat Conservation International and other groups maintain a list of qualified excluders, but it is not clear how often work is performed by recommended personnel or if it is in accordance with State regulations. Despite regulations, in some cases nuisance bats are likely being removed by nuisance wildlife trappers through methods that are not approved (e.g., removed from roosts with vacuum cleaner-like apparatuses) or excluded during time periods that are not permitted (e.g., inside the maternity season) (A. Kropp, FWC, pers. comm. 2009).

This species is also considered threatened by the Florida Committee on Rare and Endangered Plants and Animals (Belwood 1992, p. 216) and critically endangered by the IUCN (Timm and Arroyo-Cabral 2008, p. 1). However, these designations provide no legal authority or protection.

In summary, the protection currently afforded the Florida bonneted bat by the State of Florida primarily prohibits direct take of individuals (J. Gore, pers. comm. 2009). Little protection is provided to the species' occupied habitat, and there are no provisions to protect suitable but unoccupied habitat within the vicinity of known colony sites. Therefore, we conclude that the existing regulatory mechanisms are inadequate to protect this species and its habitat. We find this threat to be imminent and of moderate magnitude.

- E. Other natural or manmade factors affecting its continued existence. The Florida bonneted bat is vulnerable to a wide array of natural and human factors. Small population size and restricted range are serious concerns; these factors increase species' vulnerability. The Florida bonneted bat only occurs in six counties in Florida and only in limited numbers (Timm and Genoways 2004, p. 861-862; Marks and Marks 2008a, p. 11, 15; 2008b, p. 4). The entire population may number less than a few hundred individuals (Marks and Marks 2008a, p. 15). Due to low population size and restricted range, the Florida bonneted bat is considered to be one of the most critically endangered mammals in North America (Timm and Genoways 2004, p. 861).

Low fecundity is also a serious concern since this bat produces only one young at a time and roosts singly or in small groups (NatureServe 2009, p. 2, 4). The small numbers within localized areas may make the Florida bonneted bat vulnerable to extinction due to genetic drift, inbreeding depression, extreme weather events (e.g., hurricanes), and random or chance changes to the environment (Lande 1988, p. 1455-1459; Smith 1990, p. 310-321) that can significantly impact its habitat.

Distance between occupied locations, the small number of occupied locations, and small numbers of bats (Marks and Marks 2008a, p. 15) may make recolonization unlikely if any site is extirpated. Isolation of habitat can prevent recolonization from other sites and result in extinction. The probability of extinction increases with decreasing habitat availability (Pimm *et al.* 1988, p. 758-762, 776; Noss and Cooperrider 1994, p. 162-165; Thomas 1994, p. 373-377; Kale 1996, p. 7-11). Although changes in the environment may cause populations to fluctuate naturally, small and low density populations are more likely to fluctuate below a

minimum viable population (i.e., the minimum or threshold number of individuals needed in a population to persist in a viable state for a given interval) (Shaffer 1981, p. 131-134; Shaffer and Samson 1985, p. 146-151; Gilpin and Soule 1986, p. 19-34). Current threats to the habitat of the Florida bonneted bat may exacerbate potential problems associated with its low population numbers and increase the risk of extinction. In short, the Florida bonneted bat is vulnerable to a wide array of factors: low population size, restricted range, low fecundity, distance between occupied locations, and small number of occupied locations. These threats are significant and expected to continue or possibly increase.

That the Florida bonneted bat can adapt well to manmade structures contributes to its vulnerability and has likely been a factor in its decline (C. Marks and G. Marks, pers. comm. 2008). In general, bats using old / abandoned and new dwellings are at significant risk; bats are removed when they are no longer tolerated by humans or when structures are demolished. Adverse human impacts on bats involve direct killing, persecution, vandalism, and disturbance of hibernating and maternity colonies (Harvey *et al.* 1999, p. 13). Unpublished data from a survey of 100 pest control companies on the southeastern coast of Florida showed that requests to remove “nuisance” bats from this area all but ceased in the 20 years prior to 1982 (Belwood 1992, p. 217), indicating a sharp decline in bats. Homeowners and professionals use a variety of methods to remove bats, including lethal means (C. Marks and G. Marks, pers. comm. 2008). Even when attempts are made to remove bats humanely, bats may be sealed into buildings (C. Marks and G. Marks, pers. comm. 2008). Despite regulations, in some situations bats are still likely removed through inhumane and prohibited methods and excluded from roosts during sensitive time periods. Since roosting sites are largely unknown, the potential to remove and exclude Florida bonneted bats from human dwellings and artificial structures remains. Despite protections provided under Florida law, direct and indirect threats from humans continue.

Similarly, Robson (1989, p. 8) stated that urban development has resulted in the persecution of bats wherever they come in contact with humans. “Seemingly innocuous activities like removing dead pine or royal palm trees, pruning landscape trees (especially cabbage palms), sealing barrel-tile roof shingles with mortar, destroying abandoned buildings, and clearing small lots of native vegetation cumulatively may have a severe impact on remaining populations in urban areas” (Robson 1989, p. 9). Harvey *et al.* (1999, p. 13) indicated that disturbance to summer maternity colonies of bats is extremely detrimental. In general, maternity colonies of bats do not tolerate disturbance, especially when flightless newborns are present (Harvey *et al.* 1999, p. 13). Newborns or immature bats may be dropped or abandoned by adults if disturbed (Harvey *et al.* 1999, p. 13). Disturbance to maternity colonies of the Florida bonneted bat may be particularly damaging because of this species’ low fecundity and low abundance. In short, wherever this species occurs in or near human dwellings or structures, it is at-risk to persecution, removal, and disturbance.

Routine maintenance of bridges and overpasses are a potential threat. The Florida bonneted bat has not been documented to use these structures. However, a large colony of Brazilian free tailed bats uses the I-75 overpass at the entrance of Babcock / Webb and a single Florida bonneted bat call was recorded within one mile of this overpass; this bat could be using this

overpass given the species' flight capabilities and roosting behavior (S. Trokey, pers. comm. 2008c; C. Marks and G. Marks, pers. comm. 2008). When bridges and overpasses are cleaned (typically by the Florida Department of Transportation [FDOT]) bats are blasted with high-pressure water hoses, which likely results in death or injury (C. Marks, pers. comm. 2007). Bats using the I-75 overpass at the entrance of Babcock / Webb are at risk (C. Marks, pers. comm. 2007). During the fall of 2009, the FWC constructed a community bat house near the overpass to provide an alternate roost site; while it is not known if Florida bonneted bats will use community bat houses, space was included to accommodate larger-bodied bats in that structure (J. Morse, pers. comm. 2010).

The species is vulnerable to pesticide spraying for mosquitoes (Timm and Arroyo-Cabrales 2008, p. 5; NatureServe 2009, p. 2), and widespread application occurs in coastal counties. Organochlorine pesticides have been linked to lethal and sublethal effects to bats (Clark *et al.* 1978; Clark *et al.* 1980 and Clark 1981 as cited in Sparks 2006, p. 1), but such pesticides are no longer registered for use for mosquito control in the United States and have largely been replaced with organophosphate pesticides. It is not clear what effects organophosphate pesticides may have on bats, however, the decline of insectivorous bats might be related to decrease in food availability, sublethal toxic effects, or both (Sparks 2006, p. 1). Grue *et al.* (1997, p. 369-388) reviewed the sublethal effects of cholinesterase inhibitors (organophosphates and carbamates), the most widely used pesticides, on captive small mammals and birds and found impaired thermoregulation, reduced food consumption, and reproductive problems. They suggested that the direct toxic effects most likely reduced populations of free-living birds and mammals within treated areas (Grue *et al.* 1997, p. 369). Bats with reduced cholinesterase activity may suffer loss of coordination, impaired echolocation, and elongated response time (O'Shea and Clark 2002 as cited in Sparks 2006, p. 2). Alteration of thermoregulation could have serious ramifications to bats given their high metabolic and energy demands (Sparks 2006, p. 1-2). Reduced reproductive success would be of concern due to low reproduction rates (Sparks 2006, p. 2). Sparks (2006, p. 3-4, 6) found organophosphate residues in both bats and guano in Indiana and suspected that residues originated from consuming contaminated insects, rather than dermal or respiratory routes. He suggested that if reductions in cholinesterase from organophosphate exposure is cumulative or persisting for many days, foraging ability could be impaired such that high energy demands could not be met and increasing risk of trauma due to navigational impairment (Sparks 2006, p. 6). More work is clearly needed on the sublethal effects of organophosphate pesticides and pathways of exposure for bats in general.

In his status survey for the Florida bonneted bat, Robson (1989, p. 15) was concerned about the severe reduction in insect populations and suggested that mosquito control programs are contributing to reduced food supplies, if not directly exposing bats to toxicants (Clark 1988, p. 401-402). Robson (1989, p. 14) attributed the general reduced activity of bats along the southeastern coastal ridge to the reduction of forested habitat and reduced insect abundance. Due to the few records of the Florida bonneted bat encountered, Robson (1989, p. 15) indicated that the loss of habitat (see Factor A), reduction of food supplies, and active persecution in Miami-Dade and Broward Counties must be considered major impacts on this species. Although insect activity was not measured, Robson (1989, p. 14) noted that the

“lack of insects on the southeastern coastal ridge was striking when contrasted to all other areas”. Robson (1989, p. 15) indicated that the impacts of pesticides and other environmental toxicants may be important, but such impacts were not addressed in that study. G. T. Hubbell also believed that pesticides played a role in the decline of Florida bonneted bats in Miami (Belwood 1992, p. 220, 222). Chemicals used for mosquito control have been suggested as a contributing factor in the species’ decline in the Miami area, partially because the bat was historically common in the area and roosting sites are still abundant in the area (NatureServe 2009, p. 2) or at least not a limiting factor. While it is reasonable to attribute reduced food supply (from insecticide applications or not) or increased exposure to pesticides to the decline of the population in the Miami area, this link is only speculative since no rigorous scientific studies or direct evidence exists. Timm and Genoways (2004, p. 861) indicated that the extant, although small, population of the bat in the Fakahatchee-Big Cypress area of southwest Florida is located in one of the few areas of south Florida that has not been sprayed with pesticides. Marks and Marks (2008a, p. 15) argue that if the Florida bonneted bat’s rarity is due to a dependence on a limited food source or habitat, then the protection of that food source or habitat is critical (Marks and Marks 2008a, p. 15). Overall, pesticide applications may be impacting the bat’s foraging base or increasing its exposure, especially in coastal areas.

Natural events such as severe hurricanes may cause the loss of old trees with roosting cavities (Timm and Genoways 2004, p. 861; NatureServe 2009, p. 2). In August 1992, Hurricane Andrew, a category 5 hurricane, struck southern Miami-Dade County with sustained surface wind speeds of more than 145 mph and gusts exceeding 175 mph (Timm and Genoways 2004, p. 861). The winds destroyed the majority of older trees within several kilometers of the coast that were potentially available as roost trees (Timm and Genoways 2004, p. 861). Timm and Genoways (2004, p. 861) indicated that habitat loss from development (see factor A), increased use of pesticides, and Hurricane Andrew, may have had a significant impact on an already low population of the Florida bonneted bat.

Several less intense hurricanes have impacted both coasts of Florida in recent years. Acoustical surveys conducted in south Florida prior to the hurricane season of 2004 (from 1997 – 2003) were compared with results after the hurricanes (Marks and Marks 2008a, p. 12, D1-D6, E1-E26). The limited number of locations and low number of recorded calls suggests that the species was rare before the 2004 storm season and that the population remains low (Marks and Marks 2008a, p. 12-15). Prior to the 2004 hurricane season, calls were recorded at 4 of 10 locations; after the hurricane season calls were recorded at 9 of 44 locations (Marks and Marks 2008a, p. 12-15). Actions taken by Susan Trokey, a private landowner, to reinforce bat houses prior to Hurricane Charlie in 2004 and Hurricane Wilma in 2005 likely prevented the only extant roost site (at that time) from being destroyed; these storms caused significant damage to both trees and other property near the bat houses (S. Trokey, pers. comm. 2008c).

The major impact of intense storms can include: mortality during the storm, exposure to predation immediately following the storm, loss of roost sites, and impacts on foraging areas and insect abundance (Marks and Marks 2008a, p. 7-9). Bats can be blown into stationary

objects or impacted by flying debris, resulting in inability to fly or successfully forage, injury, or death (Marks and Marks 2008a, p. 7). Trees with cavities can be snapped at their weakest point, which for the Florida bonneted bat would likely have the most severe impact (Marks and Marks 2008a, p. 8). Displaced bats may be found on the ground or other unsuitable locations and exposed to natural predators, domestic pets, and humans (Marks and Marks 2008a, p. 8). Pregnant females have been found in June through September, and hurricanes in Florida can occur at critical life history stages - when females are pregnant or rearing young - possibly resulting in losses of pregnant females, newborns, or juvenile pups (Marks and Marks 2008a, p. 7-9). The threat of hurricanes is expected to continue and increase; the frequency of hurricanes generated in the Atlantic Basin, particularly the frequency of major hurricanes, has increased since 1995. Since the entire population may be less than a few hundred individuals (Marks and Marks 2008a, p. 15), the Florida bonneted bat may not be able to withstand losses from intense storms or storms at a critical life history stage. Due to its overall vulnerability, intense hurricanes are a significant threat; this threat is expected to continue or increase in the future.

This species is also vulnerable to prolonged extreme cold weather events, similar to the January 2010 event when air temperatures were the lowest on record over the last 10 years, reaching a low of -2 degrees C (28 degrees F) in Royal Palm, Everglades National Park (Hallac *et al.* 2010). At least eight Florida bonneted bats were lost from the Lee County colony before 12 remaining bats were brought into captivity, warmed and fed (S. Trokey, pers. comm. 2010). The rescued bats were emaciated and in poor condition; only nine survived (S. Trokey, pers. comm. 2010). Similarly, approximately 30 Brazilian free-tailed bats (*Tadarida brasiliensis*) were found dead below a bat house in Everglades City during this event (R. Arwood, pers. comm. 2010).

The Florida bonneted bat belongs to a family of bats (Molossidae) that appears to be an intermediate between tropical and temperate zone bat families (Arlettaz *et al.* 2000). Members of this family that inhabit the warmer temperate and subtropical zones incur much higher energetic costs for thermoregulation during cold weather events than those inhabiting northern regions (Arlettaz *et al.* 2000). At such temperatures, bats are likely unable to find food, and cannot re-warm themselves.

Such a stochastic, but potentially severe event poses a significant threat to the entire population. Impacts of the cold weather event are evident, but the effect on all colonies is not known.

In summary, the Florida bonneted bat is threatened by a wide array of natural and manmade factors. Small population size, restricted range, low fecundity, and few and isolated occurrences are serious on-going threats. Overall, this is a threat of high magnitude and it is imminent. Killing, persecution, vandalism, or disturbance of maternity colonies can occur at any time and have severe consequences to an already low population. We find this threat to be imminent and of high magnitude. Maintenance activities at occupied bridges and reduced insect abundance from pesticides are imminent threats of moderate magnitude. In addition, all occurrences are at-risk of hurricanes, an imminent threat, which can cause mortality, loss

of roost sites, and other severe impacts; the magnitude of this threat is high. Extreme cold weather events can also have severe impacts on the population, and increase risks from other threats by extirpating colonies or further reducing colony sizes. The lack of food resources, coupled with greatly increased metabolic rates to compensate for loss of body heat, is believed to have led to the death of several Florida bonneted bats, as well as increased susceptibility to predation and disease to the population as a whole.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

The FWC has installed 41 bat houses in its southwest region, including 14 single-chambered boxes (Morse 2008, p. 3-5). Single-chambered bat boxes are specifically designed for Florida bonneted bats because they are significantly larger than other bat species (N. Douglass, pers. comm. 2009). Eight single-chambered boxes were installed at Babcock / Webb, and occupancy was recorded in 2008 (Morse 2008, p. 3-5). Single-chambered boxes are also at other FWC properties, including Royce Ranch, Platt's Bluff, and Kicco (Morse 2008, p. 5).

The FWC has developed a conceptual management plan for the Babcock / Webb with input from public and private stakeholders in the formation of its goals, objectives and strategies (FWC 2003, p. 9). The conceptual management plan includes this species (FWC 2003, p. 25), but does not include any species-specific management actions or goals. One stated goal within the plan, however, is to manage for healthy and productive wildlife and plant communities (FWC 2003, p. 38) and another stated intent of wildlife management is to maintain and enhance populations of indigenous species present on the area (FWC 2003, p. 47).

The FWC contracted the FBC in spring 2008 to conduct acoustical surveys on several management areas in their southwest region, resulting in the detection of Florida bonneted bats at two locations along the Kissimmee River (J. Morse, pers. comm. 2008). Recommendations for bat conservation and land management have been prepared for the WMAs along the Kissimmee River and the Lake Wales Ridge Wildlife Environmental Area (WEA) (although no Florida bonneted bats were detected in the latter property) (Marks and Marks 2008c, p. 1-17; 2008d, p. 1-13).

At the Fakahatchee Preserve, while there are no specific management actions or goals for this species, FDEP emphasizes the preservation of the area's natural wilderness character, and in keeping with this goal, facilities and activities are limited (FDEP 2006, p. 2).

Researchers and volunteers plan to investigate the species of bats using the I-75 overpass and work with FDOT and FWC to prevent impacts to bats during maintenance work (C. Marks, pers. comm. 2007).

All 12 colonies will be surveyed in 2010 (C. Marks, pers. comm. 2010), and funding was secured from the Service to provide outreach to the public, particularly those conducting pest control; and to survey areas north and south of the species' known range.

SUMMARY OF THREATS

Habitat loss and alteration in forested and urban areas are substantial and imminent threats (Belwood 1992, p. 220; NatureServe 2009, p. 2). In natural areas, this species may be impacted when forests are converted to other uses or when old trees with cavities are removed. In urban settings, this species may be impacted when buildings with suitable roosts are demolished or when structures are modified to exclude bats. Few active roost sites are known, and all are artificial. Nearly half of the occurrences are on private lands; occurrences on public lands are at some risk to habitat loss and modification. Restricted to six counties in Florida (Timm and Genoways 2004, p. 861-862; Marks and Marks 2008a, p. 11, 15; 2008b, p. 4), the entire population may number less than a few hundred individuals (Marks and Marks 2008a, p. 15). Overall, the species is vulnerable to a wide array of natural and human factors. Distance between occupied locations, the small number of occupied locations, small numbers of bats, and low fecundity may make recolonization unlikely if any site is extirpated. The small numbers within localized areas may make the species vulnerable to extinction due to genetic drift, inbreeding depression, extreme weather events (e.g., hurricanes, prolonged cold temperatures), and random or chance changes to the environment. Where the species occurs in or near human dwellings or structures, it is at risk to persecution, removal, and disturbance. Pesticide applications may be impacting its food base or increasing exposure, especially in coastal areas. Due to its overall vulnerability, hurricanes and extreme weather are significant threats. Intense storms can cause mortality during the storm, exposure to predation immediately following the storm, loss of roost sites, impacts on foraging areas and insect abundance, and disruption of the maternal period. Prolonged cold temperatures can lead to a reduced foraging base or make it difficult for an individual to meet its high metabolic needs. Although disease is a significant threat for other bat species, it is not known to be a threat for the Florida bonneted bat at this time. The protection currently afforded the Florida bonneted bat is limited, provides little protection to the species' occupied habitat, and includes no provisions to protect suitable but unoccupied habitat within the vicinity of known colony sites.

RECOMMENDED CONSERVATION MEASURES

- Identify and protect individual roosts and surrounding areas from destruction and disturbance (Owre 1978, p. 44; Robson 1989, p. 9; Belwood 1992, p. 222; Marks and Marks 2008a, p. 15).
- Conduct surveys at 12 locations to determine if the species is still present following prolonged cold temperatures that occurred in January and February 2010.
- Conduct periodic monitoring for Babcock / Webb and Fakahatchee Preserve to determine if occurrences are increasing, decreasing, or stable (Marks and Marks 2008a, p. 15).
- Conduct additional survey work in the Everglades region (Marks and Marks 2008a, p. 15). Everglades National Park links the east and west portions of the known range of the Florida bonneted bat, but to date there is no evidence of their presence in this area (Marks and Marks 2008a, p. 15).
- Conduct additional survey work in the Coral Gables area and throughout the Miami area and suburbs (J. Gore, pers. comm. 2009). So few calls were recorded that it is possible only a single colony remains in the area (Marks and Marks 2008a, p. 15).

- Conduct additional surveys to better assess status in the Kissimmee River area, especially north of Kicco to determine the northern extent of the range (Marks and Marks 2008b, p. 5).
- Study any colonies found in detail to enhance what is known about the biology, ecology, requirements, and status of this species (Belwood 1992, p. 222; Marks and Marks 2008a, p. 15).
- Place bat boxes in areas such as Ft. Myers, Naples, Coral Gables, and Homestead to see if bats use, then gather information on food habits, reproductive patterns, and survival (J. Gore, pers. comm. 2009).
- Study dietary needs to determine what insects the species is feeding upon and forecast future abundance (Marks and Marks 2008a, p. 15).
- Discourage pesticide use in foraging areas (Hipes *et al.* 2001, p. N/A) and reduce the widespread use of pesticides for mosquito control in the vicinity of known occurrences or potential habitat.
- Examine the effects of pesticides on surrogate bat species in Florida (Belwood 1992, p. 222).
- Use care with activities such as removing dead pine or royal palm trees, pruning landscape trees (especially cabbage palms), sealing barrel-tile roof shingles with mortar, destroying abandoned buildings, and clearing small lots of native vegetation in urban areas (Robson 1989, p. 9).
- Maintain forested communities, including snags, in the vicinity of known occurrences (Hipes *et al.* 2001, p. N/A).
- Work with FDOT and contractors to avoid impacts to bats during bridge maintenance. Develop, implement, and disseminate management recommendations to FDOT and contractors to prevent the injury or death to bats using such structures (C. Marks, pers. comm. 2007).
- Educate pest control operators and homeowners to reduce the threat of extermination of bats (C. Marks, pers. comm. 2008). Develop educational programs and materials relating to urban wildlife enhancement and specifically to the value and importance of bats (Robson 1989, p. 9; Belwood 1992, p. 222).

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2*
	Non-imminent	Subspecies/population	3
		Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate	Imminent	Monotypic genus	7

to Low	Non-imminent	Species	8
		Subspecies/population	9
		Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: Habitat loss and alteration in forested and urban areas are substantial threats. Nearly half of the 12 occurrences are on private lands where habitat loss and alteration continues to occur; occurrences on public lands are at some risk to habitat loss and modification. Although the seven occurrences on public lands are inherently more protected than those on private lands, habitat alteration during management practices may impact roosting sites because the locations of such sites are unknown. The entire population of Florida bonneted bats may number less than a few hundred individuals (Marks and Marks 2008a, p. 15). Low fecundity is a serious concern. The small numbers within localized areas may make the species vulnerable to extinction due to genetic drift, inbreeding depression, extreme weather events, and random or chance changes to the environment. Distance between occupied locations, the small number of occupied locations, and small numbers of bats (Marks and Marks 2008a, p. 15) may make recolonization unlikely if any site is extirpated. Any bats using old / abandoned or new dwellings are at significant risk; bats are removed or excluded when no longer tolerated by humans or when structures are demolished. Experts believe this species' ability to adapt well to manmade structures places it at-risk and has likely been a factor in its decline. Disturbance of maternity roosts is of particular concern due to the species' low fecundity and small population, especially since locations of only a few roosts are known and roosts may be accidentally disturbed or destroyed. Widespread application of pesticides in coastal counties may be impacting the food base or increasing exposure; however, the overall extent of this threat is not known. All occurrences are at-risk of hurricanes and extreme weather events. Intense storms can cause mortality during the storm, exposure to predation immediately following the storm, loss of roost sites, impacts on foraging areas and insect abundance, and disruption of the maternal period. Prolonged periods of cold temperatures can have severe impacts on the population, and increase risks from other threats by weakening individuals, extirpating colonies or further reducing colony sizes. We find the magnitude of these threats is high.

Imminence: The threat of habitat destruction is occurring with loss of forested habitat and conversion to other uses; this threat is expected to increase. Human population distribution models show that south and central Florida is expected to become mostly urbanized with few exceptions (Zwick and Carr 2006, p. 2), further compromising this species' restricted range. This species' small, isolated locations, restricted range, and low fecundity may make it vulnerable to extinction due to genetic drift, inbreeding depression, and random or chance changes to the environment. Where it occurs in or near human dwellings or structures, it is at-risk to persecution, removal, exclusion, and disturbance. Disturbance from humans, either intentional or inadvertent, can occur at any of the occupied sites on private or conservation lands. Disturbance of maternity roosts is of particular concern due to this species' low fecundity and few occurrences. Widespread pesticide application to control mosquitoes in coastal counties

may be impacting its food base or increasing exposure; this threat is currently occurring and expected to continue. Hurricanes can impact the species (e.g., cause mortalities and injuries, increase exposure to predation) and its habitat (e.g., loss of roost sites). Hurricanes can occur at critical life history stages - when females are pregnant or rearing young - possibly resulting in losses of pregnant females, newborns, or juvenile pups (Marks and Marks 2008a, p. 7-9). The threat of hurricanes is expected to increase. Sustained cold can result in direct loss of colonies or individuals and increased susceptibility to other threats, such as predation and disease. Overall, threats are imminent.

Rationale for Change in Listing Priority Number (insert if appropriate): Not applicable.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. At this time, emergency listing is not warranted because the Florida bonneted bat has been found at 12 locations, some of which are protected. However, we consider the status of this species to be precarious.

DESCRIPTION OF MONITORING:

In 2005, the Service funded a status survey for the Florida bonneted bat. The objectives of this study were to assess presence and abundance and evaluate the impact of the 2004 hurricanes on foraging habitat and roost sites (Marks and Marks 2008a, p. 3). The FWC funded surveys at WMAs along the Kissimmee River, the Lake Wales Ridge WEA, and other areas in its southwest region (Marks and Marks 2008c, p. 1-17; 2008d, p. 1-13; Morse 2008, p. 2). These studies have been completed, and the results have been incorporated within this assessment. Add in survey work planned for northern and southern extent of range.

The colony roost on private land is periodically monitored by the landowner (S. Trokey, pers. comm. 2006b, 2006c, 2008b). No other monitoring is occurring; monitoring at other sites is needed. All 12 sites will be surveyed for presence/absence in 2010.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: The Service requested new information (observations, data, reports) regarding the status of this species and any new information regarding threats to this species from: FWC, FDEP, NPS (Big Cypress National Park, Everglades National Park), U.S. Forest Service, U.S. Geological Survey, U.S. Army Corps of Engineers, Service (Ecological Services, Florida Panther NWR, Ten Thousand Islands NWR), Miami-Dade County Park and Recreation Department, The Nature Conservancy, FNAI, FBC, Bat Conservation International, and bat experts at various academic institutions (e.g., University of Florida, University of Kansas, Auburn, Clemson) and those in other State governments (e.g., Tennessee, Kentucky, Indiana, Arkansas, Georgia). In total, the previous assessment was sent to more than 100 individuals.

Indicate which State(s) did not provide any information or comments: None. Kathleen Smith,

Joshua Birchfield, and Jennifer Morse of FWC provided information and / or comments on an early draft 2010. Jennifer Morse, Ricardo Zambrano, Jeff Gore, and Alex Kropp of FWC provided information in 2009. The Florida bonneted bat is recognized in Florida's Comprehensive Wildlife Conservation Strategy as one of Florida's species of greatest conservation need (FWC 2005, p. 61).

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¹ Not considered a primary reference; rather compilation of historical and current literature.

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  June 15, 2010
for Regional Director, Fish and Wildlife Service Date

Concur:  Date: October 22, 2010
ACTING
Director, Fish and Wildlife Service

Do not concur: _____
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: March 24, 2010

Conducted by: Paula Halupa, South Florida Ecological Services Office